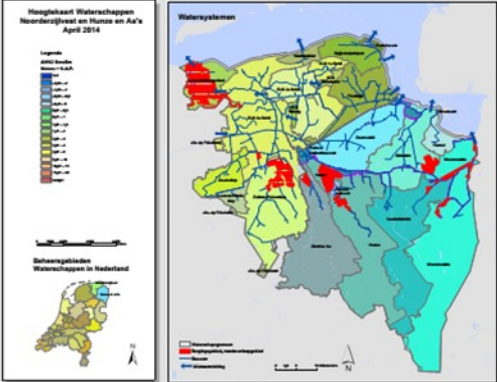
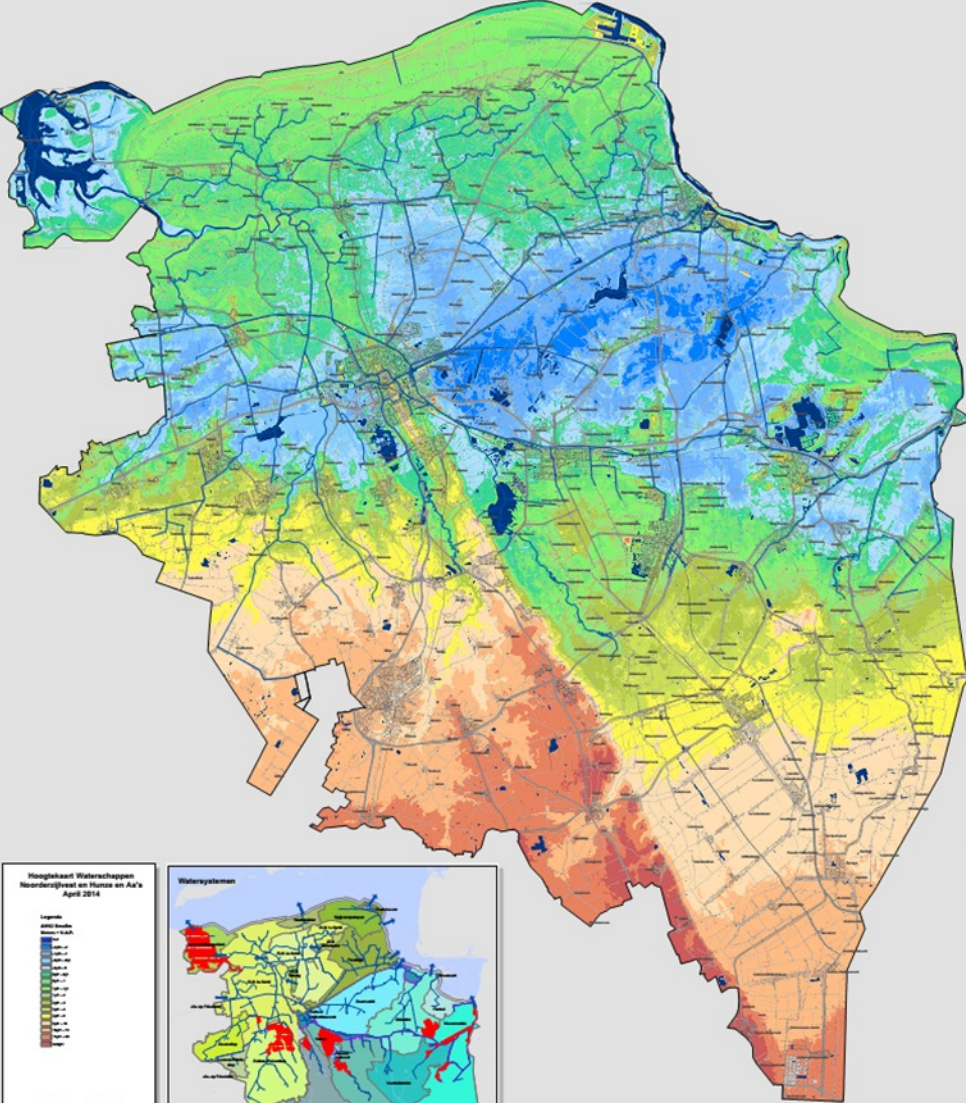
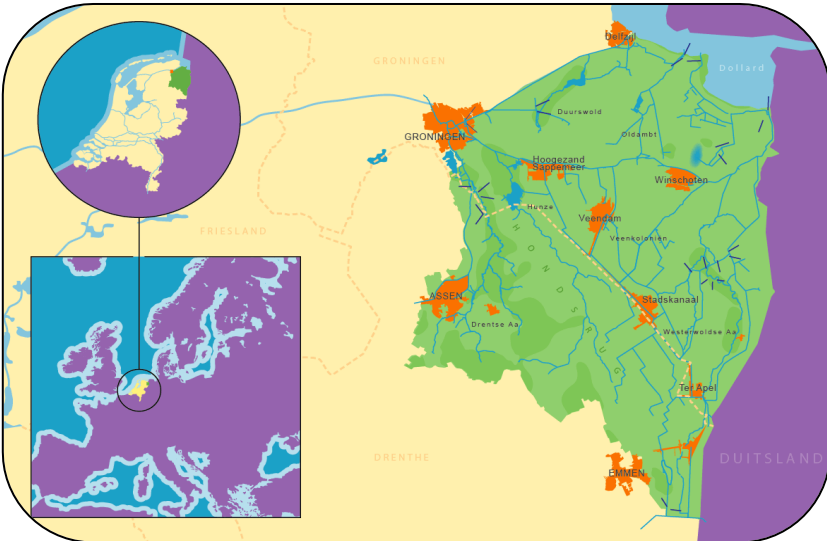




Implementing internal “Fish-Friendliness” policy at a Dutch Water Authority

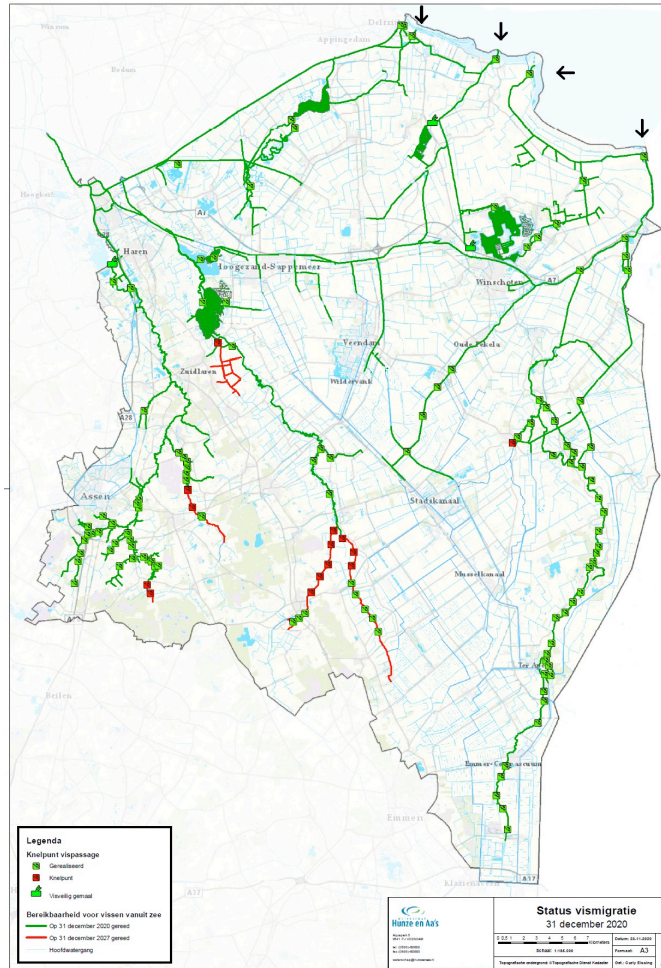


Regional Water Authority Hunze en Aa's



Fish migration plan “From sea to source”

- Working on healthy fish populations
- Priority routes (as shown on map)
- Research focus on fish damage at pumping stations.



Visie vismigratie van Wad tot Aa

Periode 2018 - 2027



Fish migration & Fish safety

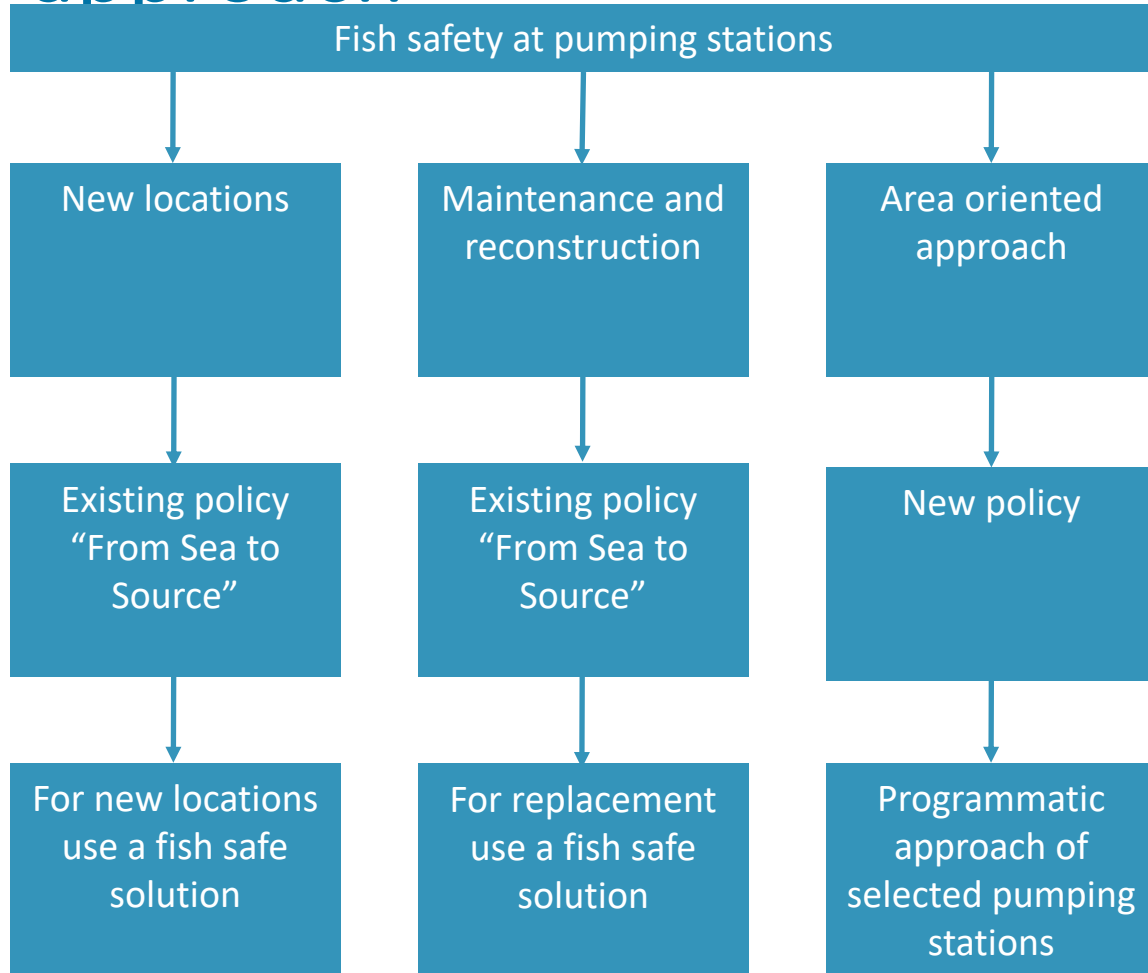


Free fish migration routes (= map fish migration plan): Creating two way fish migration possibilities. A fish pass + fish friendly pumps are necessary.

Fish safety (= animal welfare): Aiming on reduction of fish damage when they enter a pumping station. Only ensures downstream safe passage.

Attention: A fish safe pump is not always suitable for ensuring free fish migration. For example; a fish safe pump can have such a sound profile that it scares away fish in front of the pumping station. ***Fish behaviour is an important component*** of free fish migration that plays no significant role at fish safety.

Working on an area oriented approach

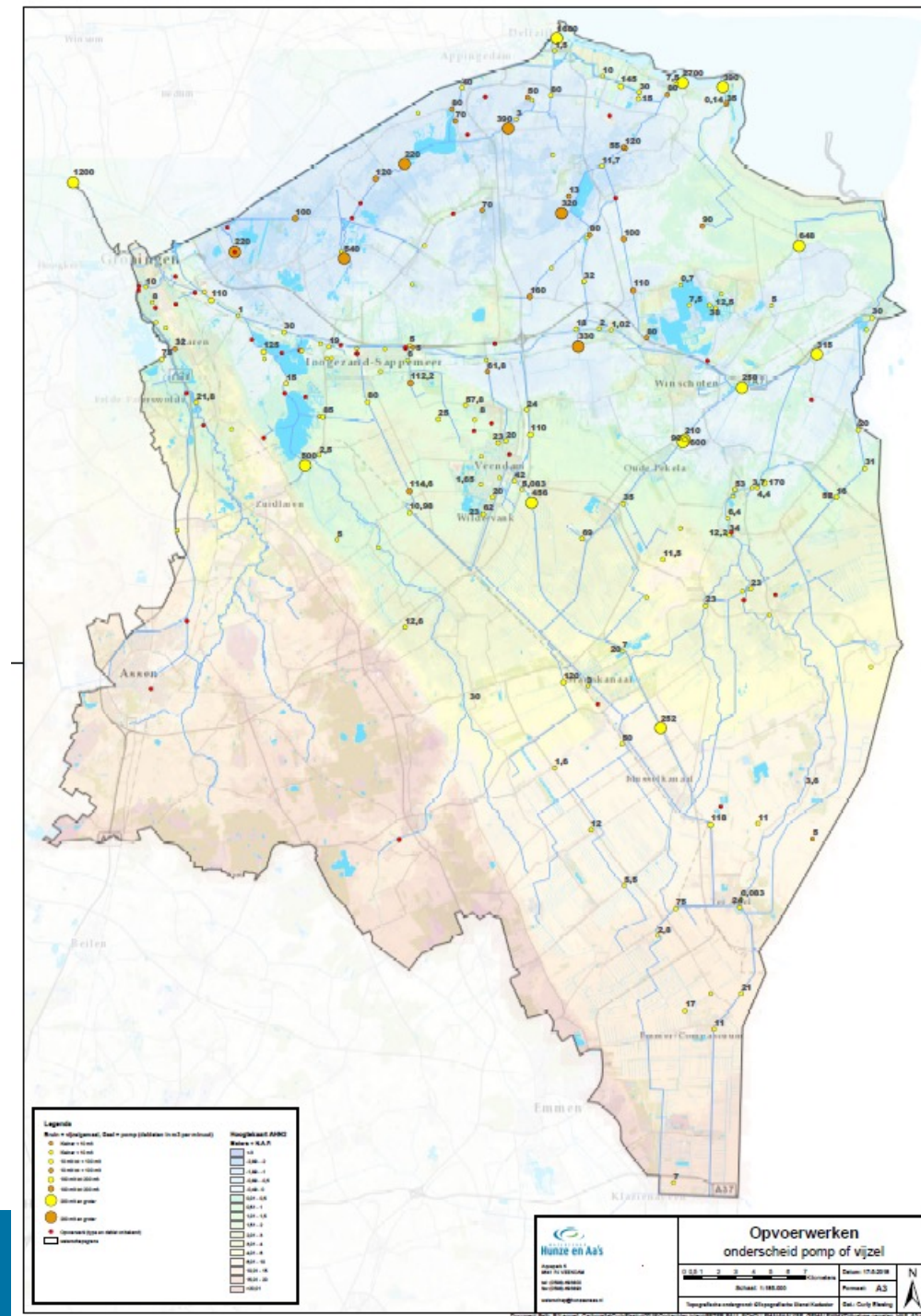


- Full replacement of pumps and Archimedes screws during maintenance doesn't happen that often
- To speed up the replacement process a programmatic approach is needed

Where to start?

4 criteria:

- Fish safety score of the pumping station
- Total capacity
- Quality of the polder system
- Percentage of open water



Testing in the field

Name	Type	% lethal damage
Ulsda	Open axial-flow pump	71%
Oostermoer	Closed axial-flow pump	31%
Oude Ae	Open archimedes screw	5,3%
Nonnegaat	Open archimedes screw	0,4%

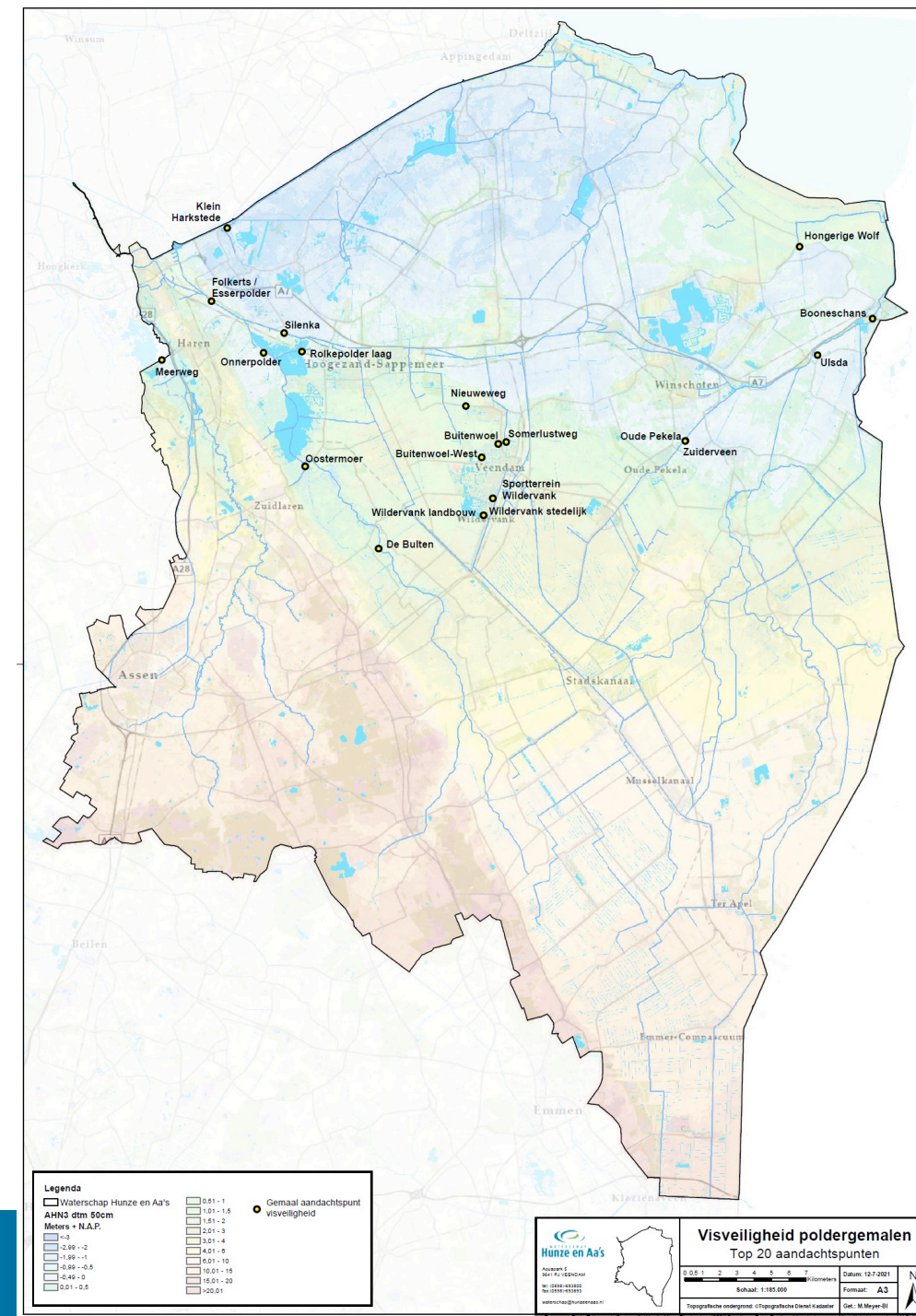


Ulsda & Oostermoer = natural passage
Oude Ae & Nonnegaat = forced passage

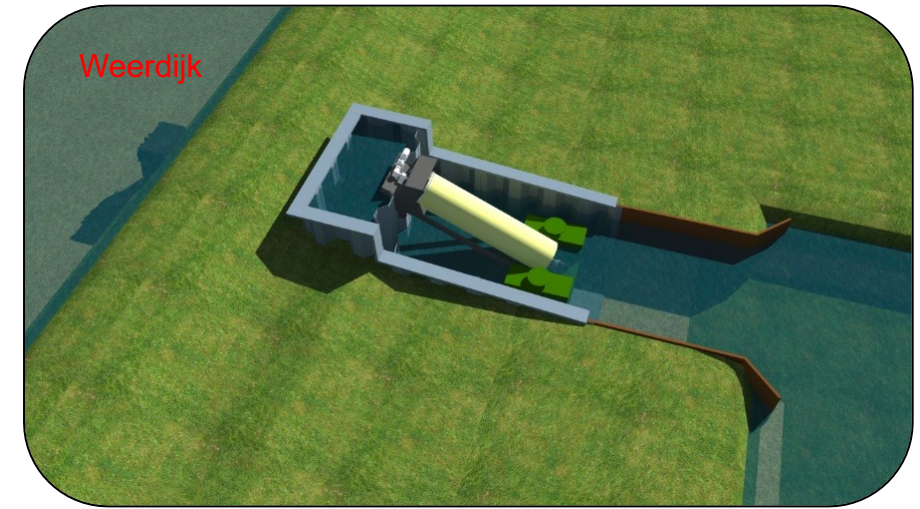
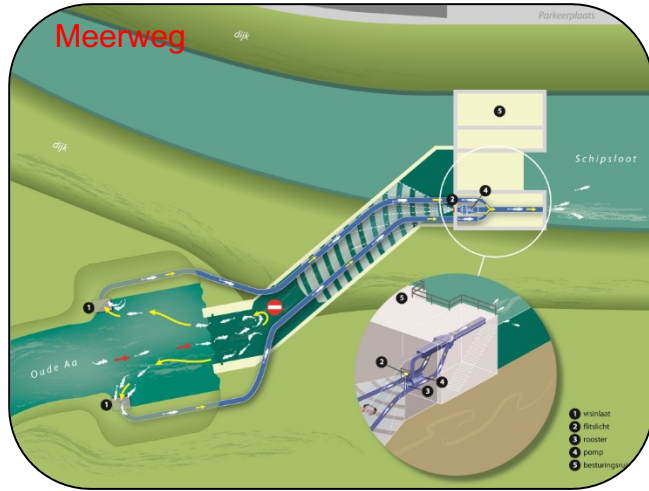
Top 20 selection

Naam	Detailtype	Aantal	Tot m3/min	Tot score	Opmerkingen
Gemaal Hongerige Wolf	gesloten schroefpomp	3	648	130	Onderzoek RBVV2
Gemaal Ulsda	open schroefpomp	3	315	130	
Gemaal Rolkepolder hoog	dompelpomp	1	18	130	
Gemaal Buitenwoel-West	schroef- of axiaalpompe	1	7,5	130	Aandachtspunt beheer
Gemaal Wildervank stedelijk	gesloten schroefpomp	1	23	120	
Gemaal Buitenwoel	open schroefpomp	2	24	120	
Gemaal Klein Harkstede	dompelpomp	1	10	120	Afwatering Woldmeer
Gemaal Silenka	centrifugaalpompe	1	30	120	Aandachtspunt beheer
Gemaal Sportterrein Wildervank	open schroefpomp	1	40	110	
Gemaal Somerlustweg	gesloten schroefpomp	2	20	110	
Gemaal Oostermoer	gesloten schroefpomp	3	500	110	Reeds lopend project
Gemaal De Bulten	centrifugaal- of radiaalpompe	2	140	110	
Gemaal Wildervank landbouw	gesloten schroefpomp	2	61	100	
Gemaal Zuiderveen	gesloten schroefpomp	2	90	100	
Gemaal Booneschans	dompelpomp	2	30	100	
Gemaal Nieuweweg	dompelpomp	2	58	100	
Gemaal Meerweg	dompelpomp	2	75	100	Voorzien van visveilige bypass
Gemaal Folkerts / Esserpolder	gesloten schroefpomp	2	110	100	
Gemaal Onnerpolder	gesloten schroefpomp	2	140	100	
Gemaal Oude Pekela	gesloten schroefpomp	3	225	100	

This does not include tidal pumping stations, Archimedes screws, emergency pumps and pumping stations < 10 m3/min (1 Exception: Buitenwoel-West → high % of damage causing operational problems)



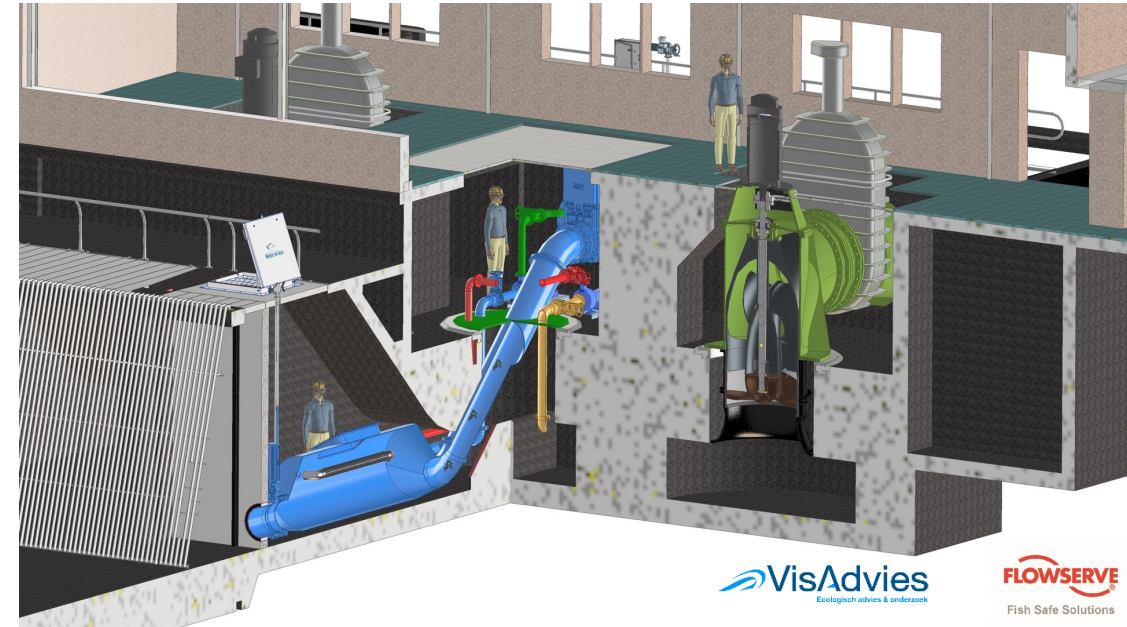
Testing possible solutions



Name of the pumping station	Year	Roach	Perch	Eel 30-60 cm	Eel 70-90 cm	Average mortality
Ennemaborgh*	2012	0%	0-5%	6-14%	0-11%	1 - 4%
Weerdijk	2020	0%	n.v.t.	0%	0%	0%
Oostermoer	2022	4,9%	n.v.t.	n.v.t.	0%	2,5%

* Tested with a forerunner of NEN 8775, several tests with varying speed and 2 different Archimedes screws carried out.

Pumping station Oostermoer (2022)



- closed axial-flow pump modified (Pannevis, 2 x 200 m³/min)
- Mortality from 30 - 35 % reduced to 2 – 3 %
- Fish lock installed for 2-way passage

Start with 5 larger pumping stations

Name	Number and type of pump
Hongerige Wolf	3 Closed axial-flow pump
Wildervank stedelijk	1 Closed axial-flow pump
Wildervank landbouw	2 Closed axial-flow pump
Sportterrein Wildervank	1 Open axial-flow pump
Folkers/Esserpolder	2 Closed axial-flow pump

Hongerige Wolf



Folkers/Esserpolder



Sportterrein Wildervank



Wildervank landbouw/stedelijk



Further research at 5 smaller locations

- Change from Pump to Archimedes screw?
- How many fish are actually passing and getting damaged?
- Availability of new technical solutions in the upcoming years?

Name pumping station

Buitenwoel West

Rolkepolder Hoog

Buitenwoel

Klein Harkstede

Silenka

Silenka



Rolkepolder Hoog



Buitenwoel West



Buitenwoel



Klein Harkstede





Questions?

